QUALITY ASSURANCE PROJECT PLAN

CONNECTICUT RIVER FISH TISSUE STUDY

Brown Engineering
for
Fort Longstreet

Based on the Intergovernmental Data Quality Task Force Uniform Federal Policy for Quality Assurance Project Plans

April 6, 2000

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QAPP Worksheet #1
Title and Approval Page

Site Name/Project Name: Connecticut River Fish Tissue Study
Site Location: Connecticut River

Title: Connecticut River Fish Tissue Study
Revision Number: 0
Revision Date: 04/06/00
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Quality Assurance Project Plan for Connecticut River Fish Tissue Study
Document Title

Fort Longstreet
Lead Organization (Agency, State, Tribe, Federal Facility, PRP, or Grantee)

Mary Facts, Brown Engineering
Preparer's Name and Organizational Affiliation

24K Diamond Lane, Hope, Vermont (997-799-1431)
Preparer's Address and Telephone Number

April 6, 2000
Preparation Date (Day/Month/Year)

Investigative Organization's Project Manager: Amy Lee
Signature

Amy Lee, Brown Engineering, April 6, 2000
Printed Name/Organization/Date

Investigative Organization's Project QA Officer: Andy Owens
Signature

Andy Owens, Brown Engineering, April 12, 2000
Printed Name/Organization/Date

Lead Organization's Program Manager: Thomas Jackson
Signature

Thomas Jackson, Fort Longstreet, April 15, 2000
Printed Name/Organization/Date

Approval Signatures: John Smith
Signature

John Smith, RPM – U.S. EPA Region 13, May 12, 2000
Printed Name/Title/Date

U.S. EPA Region 13
Approval Authority

Other Approval Signatures: Betty Fox
Signature

Betty Fox, QAM/U.S. EPA Region 13, May 9, 2000
Printed Name/Title/Date

Document Control Number: FISH-00

QAPP Worksheet #2
QAPP Identifying Information

Site Name/Project Name: Connecticut River Fish Tissue Study
Site Location: Connecticut River
Site Number/Code: N/A
Operable Unit: N/A
Contractor Name: Brown Engineering
Contractor Number: 990032
Contract Title: A&E Support Services
Work Assignment Number: 990032-7

Title: Connecticut River Fish Tissue Study
Revision Number: 0
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1. Identify guidance used to prepare QAPP:
   Federal Consensus Guidance for the Preparation of Quality Assurance Project Plans
2. Identify program: U.S. EPA Region 13, CWA - Water Quality
3. Identify approval entity: U.S. EPA Region 13
4. Indicate whether the QAPP is a generic program QAPP or a (project-specific QAPP.) (circle one)
5. List dates of scoping meetings that were held: 9/10/99
6. List dates and titles of QAPP documents written for previous site work, if applicable:

Title	Approval Date
N/A	

7. List organizational partners (stakeholders) and connection with Lead Organization:
   U.S. EPA Region 13
8. List data users: U.S. EPA Region 13, RPM, Fort Longstreet; U.S. EPA Region 13 Human Health Risk Assessors
9. If any required QAPP elements (1- 20), worksheets and/or required information are not applicable to the project, then circle the omitted QAPP Elements, Worksheets and Required Information on the attached Table. Provide an explanation for their exclusion below:
   Worksheets 9c, 14, 22a, 22b, 23a, and 23b are not applicable to this project due to the fact that field QC samples will not be collected for fish matrices.

QAPP Identifying Information

Circle QAPP elements and required information that are not applicable to the project. Provide an explanation in this section of the QAPP.

REQUIRED QAPP ELEMENT(S) AND CORRESPONDING QAPP SECTION(S)	REQUIRED INFORMATION (TEXT, TABLES, OR WORKSHEETS)
Project Management and Objectives	
2.1 Title and Approval Page	- Title and Approval Page (Worksheet #1)
2.2 Table of Contents and Document Format 2.2.1 Table of Contents 2.2.2 Document Control Format 2.2.3 Document Control Numbering System 2.2.4 QAPP Identifying Information	- Table of Contents - QAPP Identifying Information (Worksheet #2)
2.3 Distribution List and Project Personnel Sign-Off Sheet	- Distribution List (Worksheet #3) - Project Personnel Sign-Off Sheet (Worksheet #4)
2.4 Project Organization 2.4.1 Project Organizational Chart 2.4.2 Communication Pathways 2.4.2.1 Modifications to Approved QAPP 2.4.3 Personnel Responsibilities and Qualifications 2.4.4 Special Training Requirements/Certification	- Organizational Chart (Worksheet #5) - Communication Pathways (Text) - Personnel Responsibilities and Qualifications Table (Worksheet #6) - Special Personnel Training Requirements Table (Worksheet #7)
2.5 Project Planning/Problem Definition 2.5.1 Project Planning Meetings 2.5.2 Problem Definition/Site History and Background	- Project Planning Meeting Documentation - Project Scoping Meeting Attendance Sheet with Agenda (Worksheet #8) - Problem Definition/Site History and Background - Site Maps (historical and present)
2.6 Project Description and Schedule 2.6.1 Project Overview 2.6.2 Project Schedule	- Project Description (Worksheet #9a) - Contaminants of Concern and Other Target Analytes Table (Worksheet #9b) - Field Quality Control Sample Summary Table (Worksheet #9c) - Analytical Services Table (Worksheet #9d) - System Designs - Project Schedule Timeline Table (Worksheet #10)
2.7 Project Quality Objectives and Measurement Performance Criteria 2.7.1 Project Quality Objectives 2.7.2 Measurement Performance Criteria	- Measurement Performance Criteria Table (Worksheet #11)

QAPP Identifying Information

REQUIRED QAPP ELEMENT(S) AND CORRESPONDING QAPP SECTION(S)	REQUIRED INFORMATION (TEXT, TABLES, OR WORKSHEETS)
Measurement/Data Acquisition	
3.1.1 Sampling Process Design 3.1.1.1 Sampling Design Rationale	- Sampling Design and Rationale (Worksheet #12a) - Sampling Locations, Sampling and Analysis Methods/SOP Requirements Table (Worksheet #12b) - Sample Location Map
3.1.2 Sampling Procedures and Requirements 3.1.2.1 Sampling Procedures 3.1.2.2 Sampling SOP Modifications 3.1.2.3 Cleaning and Decontamination of Equipment/Sample Containers 3.1.2.4 Field Equipment Calibration 3.1.2.5 Field Equipment Maintenance, Testing, and Inspection Requirements 3.1.2.6 Inspection and Acceptance Requirements for Supplies/Sample Containers	- Sampling SOPs - Project Sampling SOP Reference Table (Worksheet #13) - Sampling Container, Volumes, and Preservation Table - Field Sampling Equipment Calibration Table (Worksheet #14) - Cleaning and Decontamination SOPs - Field Equipment Maintenance, Testing, and Inspection Table (Worksheet #15)
3.1.3 Sample Handling, Tracking, and Custody Requirements 3.1.3.1 Sample Collection Documentation 3.1.3.1.1 Field Notes 3.1.3.1.2 Field Documentation Management System 3.1.3.2 Sample Handling and Tracking System 3.1.3.3 Sample Custody	- Sample Handling, Tracking and Custody SOPs - Sample Handling Flow Diagram (Worksheet #16) - Sample Container Label (Sample Tag) - Chain-of-Custody Form and Seal
3.2.1 Field Analytical Method Requirements 3.2.1.1 Field Analytical Methods and SOPs 3.2.1.2 Field Analytical Method/SOP Modifications 3.2.1.3 Field Analytical Instrument Calibration 3.2.1.4 Field Analytical Instrument/ Equipment Maintenance, Testing, and Inspection Requirements 3.2.1.5 Field Analytical Inspection and Acceptance Requirements for Supplies	- Field Analytical Methods/SOPs - Field Analytical Method/SOP Reference Table (Worksheet #17) - Field Analytical Instrument Calibration Table (Worksheet #18) - Field Analytical Instrument/Equipment Maintenance, Testing, and Inspection Table (Worksheet #19)

QAPP Identifying Information

REQUIRED QAPP ELEMENT(S) AND CORRESPONDING QAPP SECTION(S)	REQUIRED INFORMATION (TEXT, TABLES, OR WORKSHEETS)
3.2.2 Fixed Laboratory Analytical Method Requirements 3.2.2.1 Fixed Laboratory Analytical Methods and SOPs 3.2.2.2 Fixed Laboratory Analytical Method/SOP Modifications 3.2.2.3 Fixed Laboratory Instrument Calibration 3.2.2.4 Fixed Laboratory Instrument/ Equipment Maintenance, Testing, and Inspection Requirements 3.2.2.5 Fixed Laboratory Inspection and Acceptance Requirements for Supplies	- Fixed Laboratory Analytical Methods/SOPs - Fixed Laboratory Analytical Method/SOP Reference Table (Worksheet #20) - Fixed Laboratory Instrument Maintenance and Calibration Table (Worksheet #21)
3.3.1 Quality Control Requirements 3.3.1.1 Sampling Quality Control 3.3.1.2 Analytical Quality Control 3.3.1.2.1 Field Analytical QC 3.3.1.2.2 Fixed Laboratory QC	**Sampling** - Field Sampling QC Table (Worksheet #22a) - Field Sampling SOP Precision and Accuracy Table (Worksheet #22b) **Analytical** - Field Analytical QC Sample Table (Worksheet #23a) - Field Analytical Method/SOP Precision and Accuracy Table (Worksheet #23b) - Field Screening/Confirmatory Analysis Decision Tree - Fixed Laboratory Analytical QC Sample Table (Worksheet #24a) - Fixed Laboratory Method/SOP Precision and Accuracy Table (Worksheet #24b)
3.4.1 Data Acquisition Requirements	- Non-Direct Measurements Criteria and Limitations Table (Worksheet #25)
3.5.1 Documentation, Records, and Data Management 3.5.1.1 Project Documentation and Records 3.5.1.2 Field Analysis Data Package Deliverables 3.5.1.3 Fixed Laboratory Data Package Deliverables 3.5.1.4 Data Reporting Formats 3.5.1.5 Data Handling and Management 3.5.1.6 Data Tracking and Control	- Project Documents and Records Table (Worksheet #26) - Data Management SOPs

QAPP Identifying Information

REQUIRED QAPP ELEMENT(S) AND CORRESPONDING QAPP SECTION(S)	REQUIRED INFORMATION (TEXT, TABLES, OR WORKSHEETS)
Assessment/Oversight	
4.1 Assessments and Response Actions 4.1.1 Planned Assessments 4.1.2 Assessment Findings and Corrective Action Responses 4.1.3 Additional QAPP Nonconformances	- Assessment and Response Actions (Worksheet #27a) - Project Assessment Table (Worksheet #27b) - Audit Checklists
4.2 QA Management Reports	- QA Management Reports Table (Worksheet #28)
Data Verification/Validation and Usability	
5.1 Verification and Validation Requirements and Procedures	- Data Verification/Validation Process Table (Worksheet #29a) - Data Verification/Validation Summary Table (Worksheet #29b)
5.2 Data Usability/Reconciliation with Data Quality Objectives	- Data Usability Assessment (Worksheet #30)

Note: All QAPP Worksheets, when used, should be completed with project-specific information. If the QAPP Worksheets are not used, the information the worksheets require must still be presented in the QAPP. In addition, other project-specific information should be provided in tabular format, as much as practicable. However, sufficient written discussion in text format should accompany these tables. Certain sections, by their nature, will require more written discussion than others. In particular, Section 3.1.1 should provide an in-depth explanation of the sampling design rationale and Sections 5.1 and 5.2 should describe the procedures and criteria that will be used to verify, validate, and assess data usability.

Distribution List

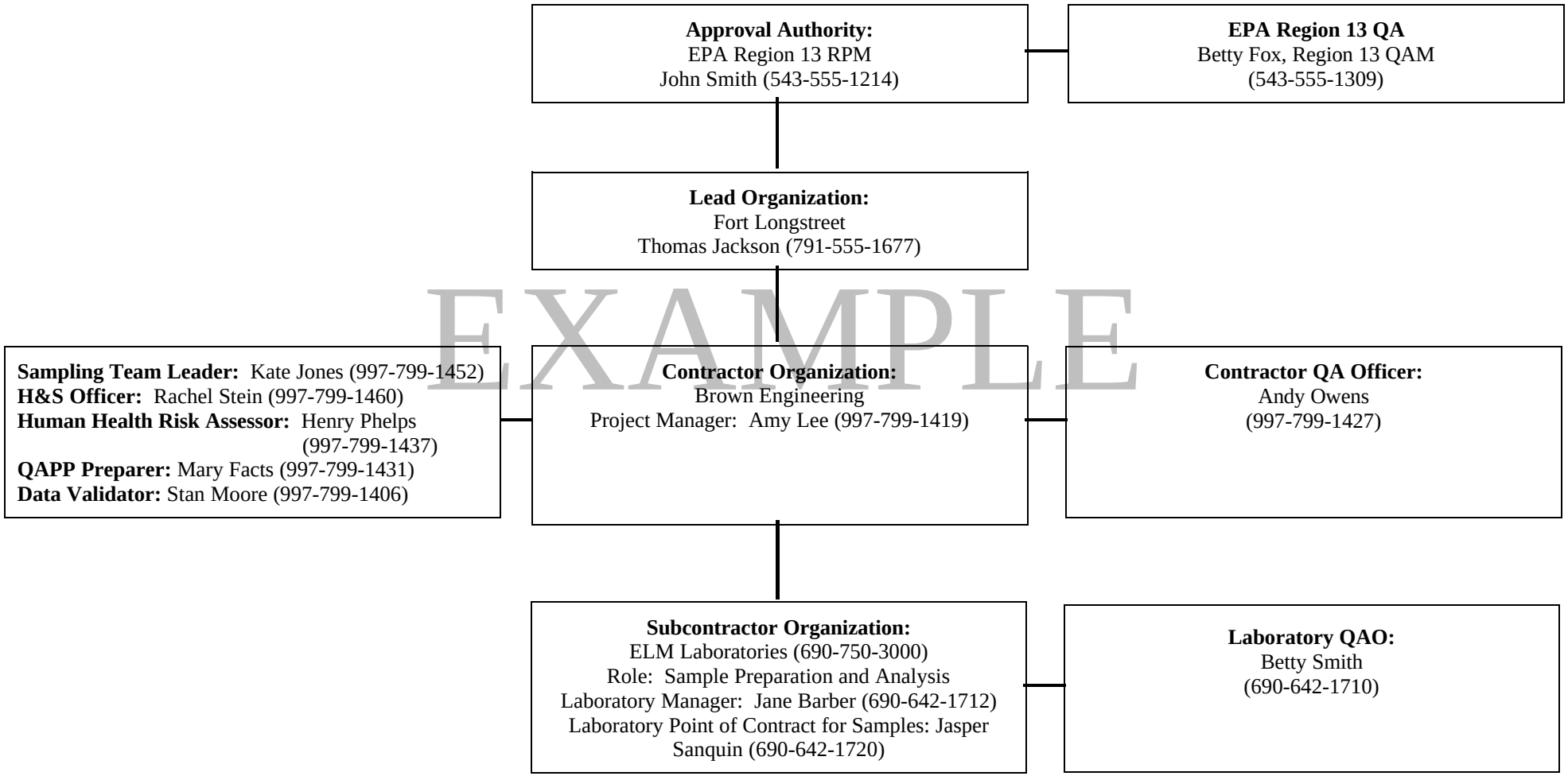
QAPP Recipients	Title	Organization	Telephone Number	Document Control Number
Thomas Jackson	Program Manager	Fort Longstreet	791-555-1677	FISH-01
John Smith	EPA Region 13 RPM	U.S. EPA Region 13	543-555-1214	FISH-02
Betty Fox	EPA Region 13 QAM	U.S. EPA Region 13	543-555-1309	FISH-03
Amy Lee	Project Manager	Brown Engineering	997-799-1419	FISH-04
Andy Owens	Project QA Officer	Brown Engineering	997-799-1427	FISH-05
Mary Facts	Project QAPP Preparer	Brown Engineering	997-799-1431	FISH-06
Kate Jones	Project Sample Team Leader	Brown Engineering	997-799-1452	FISH-07
Stan Moore	Project Data Validator	Brown Engineering	997-799-1406	FISH-08
Rachel Stein	Health and Safety Officer	Brown Engineering	997-799-1460	FISH-09
Henry Phelps	Human Health Risk Assessor	Brown Engineering	997-799-1437	FISH-10
Jane Barber	Laboratory Manager	ELM Laboratories	690-642-1712	FISH-11
Betty Smith	Laboratory QAO	ELM Laboratories	690-642-1710	FISH-12

Project Personnel Sign-Off Sheet

Organization: Fort Longstreet/Brown Engineering/ELM Laboratories

Title	Telephone Number	Signature	Date QAPP Read	QAPP Acceptable as Written
Thomas Jackson/Fort Longstreet	791-555-1677	*Thomas Jackson*	04/15/2000	Yes
Amy Lee/Brown Engineering	997-799-1419	*Amy Lee*	04/06/2000	Yes
Mary Facts/Brown Engineering	997-799-1431	*Mary Facts*	N/A	Yes
Andy Owens/Brown Engineering	997-799-1427	*Andy Owens*	04/12/2000	Yes
Kate Jones/Brown Engineering	997-799-1452	*Kate Jones*	04/12/2000	Yes
Stan Moore/Brown Engineering	997-799-1406	*Stan Moore*	04/12/2000	Yes
Rachel Stein/Brown Engineering	997-799-1470	*Rachel Stein*	04/13/2000	Yes
Henry Phelps/Brown Engineering	997-799-1437	*Henry Phelps*	04/13/2000	Yes
Ben Coates/Brown Engineering	997-799-1438	*Ben Coates*	04/14/2000	Yes
Jane Barber/ELM Laboratories	690-642-1712	*Jane Barber*	04/10/2000	Yes
Betty Smith/ELM Laboratories	690-642-1710	*Betty Smith*	04/11/2000	Yes
Jasper Sanquin/ELM Laboratories	690-642-1720	*Jasper Sanquin*	04/09/2000	Yes

Organizational Chart



Communication Pathways

- Thomas Jackson will be the primary point of contact for John Smith (U.S. EPA Region 13 RPM).
- Amy Lee will be the responsible person for all project phases and will take direction from Thomas Jackson and will communicate with John Smith (the RPM) on matters of field related problems. Communication may be via e-mail, fax, mailed reports.
- Kate Jones will report daily field progress to Amy Lee, Thomas Jackson, and John Smith via either e-mail or fax.
- ELM Laboratories manager Jane Barber will address QA and analytical questions to Andy Owens.
- Kate Jones will coordinate all sample collection/lab receipt and analysis with Jane Barber.
- Andy Owens will be the contact point for Stan Moore on questions regarding sampling, analysis, or field quality control samples.
- Corrective actions required due to sampling or analysis problems will be determined by Andy Owens.
- No data will be released until data are validated and then approved for release by Stan Moore, Andy Owens, Amy Lee, and Thomas Jackson.
- If the QAPP must be amended due to field conditions, schedule changes, or analytical problems (not meeting required QLs, etc.), the changes must be approved first by Amy Lee, then Thomas Jackson, and finally by John Smith before future work can proceed under the amendment.

Personnel Responsibilities and Qualifications Table[1]

Name	Title	Organizational Affiliation	Responsibilities	Education and Experience Qualifications
Thomas Jackson, P.E.	Program Manager	Fort Longstreet	Oversees project and responds to EPA	M.S., Environmental Engineering, 18 yrs. exp.
Amy Lee	Project Manager	Brown Engineering	Manages project – coordinates between lead agency and subcontractor	M.S., Biology, 15 yrs. exp.
Andy Owens	QA Officer	Brown Engineering	QA oversight	M.S., Environmental Science, 10 yrs. exp.
Mary Facts	QAPP Preparer	Brown Engineering	Prepares QAPP	B.S., Chemistry, 7 yrs. exp.
Stan Moore	Data Validator	Brown Engineering	Performs data validation	B.S., Chemistry, 8 yrs. exp.
Kate Jones	Sampling Team Leader	Brown Engineering	Supervises field sampling and coordinates all field activities	B.S., Biology, 6 yrs. exp.
Rachel Stein	H&S Officer	Brown Engineering	Oversees H&S for field activities	B.S., Biology, 4 yrs. exp.
Henry Phelps	Risk Assessor	Brown Engineering	Performs human health risk assessment	M.S., Biology, 14 yrs. exp.
Jane Barber	Laboratory Manager	ELM Laboratories	Manages generation of analytical data	M.S., Chemistry, 16 yrs. exp.
Betty Smith	Lab QAO	ELM Laboratories	Performs lab QA oversight	B.S., Chemistry, 13 yrs. exp.

[1]All resumes are on file with Brown Engineering's Hope office.

Special Personnel Training Requirements Table

Project Function	Specialized Training – Title of Course or Description	Training Provided By	Training Date	Personnel/Groups Receiving Training	Personnel Titles/ Organizational Affiliation	Location of Training Records/Certificates*
Electro Fishing	Principles and Techniques of Electro Fishing	USFWS	June 1, 1998	Kate Jones Rachel Stein Ben Coates	Sampling Team Leader H&S Officer Field Sampler	Brown Engineering: Certificates available on request

*If training records and/or certificates are on file elsewhere, document their location in this column. If training records and/or certificates do not exist or are not available, then this should be noted.

Project Scoping Meeting Attendance Sheet

EPA Regulation Program: RCRA FIFRA TSCA CERCLA DW CWA CAA **Program: Brownfields, NPDES, etc. Section 319** **Projected Date(s) of Sampling June – September 2000** **Project Manager Amy Lee**	**Site Name Connecticut River** **Site Location Connecticut River** **CERCLA Site/Spill Identifier No. N/A** **Operable Unit N/A** **Other Site Number/Code N/A** **Phase: ERA SA/SI pre-RI RI (phase I, etc.) FS RD RA post-RA (circle one) N/A** **Other phase: N/A**

Date of Meeting: 9/10/99
Meeting Location: Brown Engineering, Hope, Vermont

Name	Title	Affiliation	Phone #	Project Role
John Smith	U.S. EPA Region 13 RPM	U.S. EPA	543-555-1214	RPM
Betty Fox	U.S. EPA Region 13 QAM	U.S. EPA	543-555-1309	QAM
Thomas Jackson	Program Manager	Fort Longstreet	791-555-1677	Project Manager
Amy Lee	Project Manager	Brown Engineering	997-799-1419	Project Manager
Andy Owens	QA Officer	Brown Engineering	997-799-1427	Provides QA oversight
Mary Facts	QAPP Preparer	Brown Engineering	997-799-1431	Prepares QAPP
Kate Jones	Sampling Team Leader	Brown Engineering	997-799-1452	Supervises field sampling
Rachel Stein	Health and Safety Officer	Brown Engineering	997-799-1460	Writes and oversees implementation of Health and Safety Plan
Henry Phelps	Risk Assessor	Brown Engineering	997-799-1437	Develops human health risk assessment
Stan Moore	Data Validator	Brown Engineering	997-799-1406	Ensures data are validated per QAPP requirements
Jane Barber	Laboratory Manager	ELM Laboratories	690-642-1712	Oversees sample prep and analysis
Betty Smith	Lab QAO	ELM Laboratories	690-642-1710	Reviews data packages and ensure all lab QC objectives are met

Meeting Purpose: Plan initial phase of project; detail requested analyses, detection limits and DQIs; establish schedule of deliverables.

Comments: Final QAPP to be finished by April 2000.

Project Description

PROBLEM DEFINITION/SITE HISTORY AND BACKGROUND

The Connecticut River has relatively low concentrations of toxic pollutants in its water column (generally within State and Federal water quality criteria). However, pollutants deposited as a result of past activities at Fort Longstreet represent a potential problem. These past activities have included liberal use of various aroclors/pesticides on the rifle ranges. Mercury contamination is believed to have originated from the use of mercury-containing explosive compounds on the artillery range. Aroclors/Pesticides and mercury have remained in the food chain to bioaccumulate (concentrate) in certain fish species, such as carp and bass. Bioaccumulation to levels which pose long-term health risks for fish consumers is believed to be associated with trace-level contaminants present in the water and sediment.

PROJECT DESCRIPTION AND SCHEDULE
Project Overview

The objective of the fish tissue study is to perform a watershed-wide fish tissue monitoring program which would document current conditions with regard to contaminant concentrations of respective fishes from the main stream of the Connecticut River to revise human health consumption advisories. In addition, the monitoring program would allow for subsequent sampling at regular intervals to monitor trends in Connecticut River fish tissue contaminant concentrations.

Brown Engineering will be responsible for conducting a human health risk assessment based on the data collected. In addition, sufficient data with reliable quality assurance/quality control will be collected so that statistical comparison of concentrations seen in 2000 can be made to data collected in the future.

The program will contain the following elements:
- Representative sampling locations chosen by and located downstream of Fort Longstreet in six separate river reaches (site locations will be well distributed spatially and will also take into consideration major hydrologic features such as dams and tributaries).
- Standard protocols for sample collection, handling, sample preparation, and analytical methods.
- As consistent a sample type among sampling locations as possible (species, age or size, number in composite).
- All sampling will be conducted within as small a time frame as possible.

Project Description (Continued)

Target Species Selection

The fish species targeted for this survey were selected in order to represent the potentially worst cases for contaminant uptake in the waterbody, the species most likely to be consumed by the fishing population on the river, and species representing different in-river habitat niches and trophic feeding levels.

Samples of resident fishes, which include yellow perch (YP), smallmouth bass (SMB), and white sucker (WS), will consist of five 3-fish fillet and offal composites of each species from all sampling locations. Eastern brook trout (EBT) samples will consist of five 3-fish fillet and offal composites. Samples of American shad (AS) and striped bass (SB) will consist of five 3-fish fillet and offal composites of each species, and for blueback (B) herring only, the analyses will be in five 3-whole fish composites.

The river has been divided into six separate reaches for which samples will be collected. YP, SMB, and WS will be collected in all six reaches. AS, SB, and B will be collected only in Reach 3. EBT will be collected only in Reach 6.

Sampling Tasks:
1. Fish collection utilizing shock boat and standard electrofishing techniques, gill nets, rod and reel, fyke nets or other appropriate methods.
2. Surface Water quality parameters (pH, specific conductance, dissolved oxygen, and temperature)
3. GPS
4. Digital photos

Analysis Tasks:
1. ELM Laboratories to process, prepare, and analyze fish tissue for Aroclors/Pesticides and Mercury
2. Fish length, weight, age (via extraction and analyses of otoliths), and sex information to be collected by ELM Laboratories.

Quality Control Tasks:
1. Implement SOPs for fish capture, packaging and transport, and post field processing prior to analysis, and sample preparation/analysis methods.

Data Management Tasks:
1. Analytical data will be place in a database after validation.

Project Description (Continued)

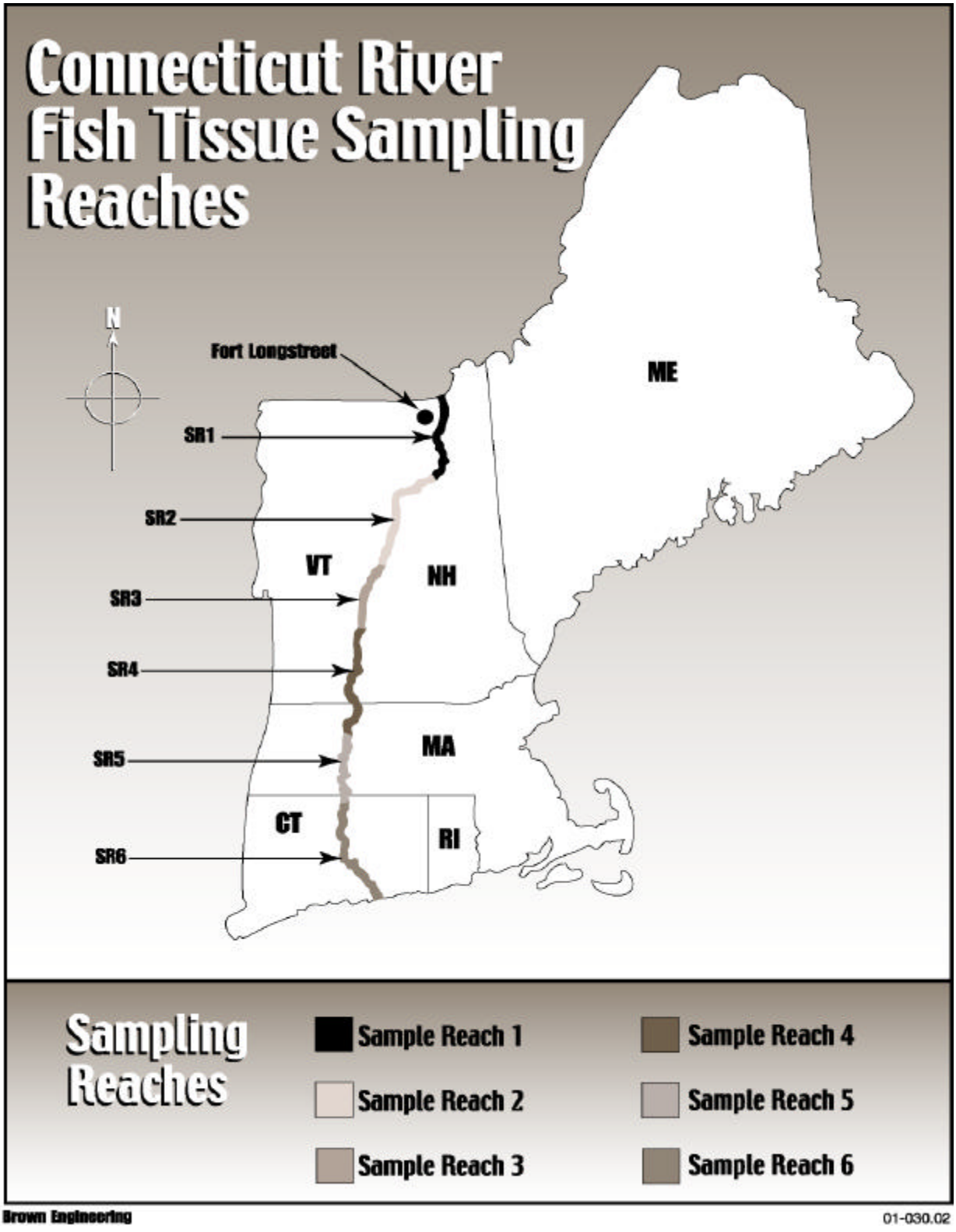
Documentation and Records:
1. All samples collected will have GPS locations documented, records of each sample collected in notebooks, and all field measurements documented in notebooks. COCs, airbills, and sample logs will be prepared and retained for each sample.
2. Copy of finalized QAPP retained in central file area

Data Packages:
1. ELM Laboratories complete analytical data package [Aroclors/Pesticides, Hg] in accordance with Region 13 Data Validation Functional Guidelines for Evaluating Environmental Analyses.

Assessment/Audit Tasks:
1. Field Sample Collection and Documentation Audits: week of June 16, 2000.
2. Laboratory TSA April 24, 2000.

Data Verification and Validation Tasks:
1. ELM Laboratories will verify that all data are complete for samples received. All data package deliverables requirements will be met. Data will be validated by Brown Engineering at the Tier II level using Region 13 Data Validation Functional Guidelines for Evaluating Environmental Analyses. Achievement of all project-specific measurement performance criteria (MPC) and data validation criteria (DVC) will be evaluated during the Tier II data validation, and the analytical measurement error will be assessed. A Tier II Data Validation Report will be produced for each Sample Delivery Group.

Data Usability Assessment Tasks:
1. Validated data and all related field logs/notes/ records will be reviewed to assess total measurement error and determine overall usability of the data for project purposes. Data limitations will be determined and data will be compared to Project Quality Objectives and required Action Limits. Corrective action is initiated, as necessary. Final data are placed in database, with any necessary qualifiers, and tables, charts, and graphs are generated.


Connecticut River
Fish Tissue Sampling
Reaches
N
Fort Longstreet
SR1
SR2
SR3
SR4
SR5
SR6
ME
VT
NH
MA
CT
RI
Sampling
Reaches
Sample Reach 1
Sample Reach 2
Sample Reach 3
Sample Reach 4
Sample Reach 5
Sample Reach 6
Brown Engineering
01-030.02

Medium/Matrix: Fish Tissue
Matrix Code (from OPTIONAL DQO Summary Form):
Analytical Parameter: Organic – Aroclors/Pesticides
Concentration Level: Low
Field Analytical or Fixed Laboratory Method/SOP[1]: L-2

Contaminants of Concern and Other Target Analytes Table (Reference Limit and Evaluation Table)

Analyte	CAS Number	Project Action Limit (Units) (wet weight)	Project Quantitation Limit (Units) (wet weight)	Analytical Method		Achievable Laboratory Limits	
				MDLs[1]	Method QLs[1]	MDLs[2]	QLs[2]
Aldrin	309-00-2	0.01 mg/Kg	0.002 mg/Kg	0.00025 mg/Kg	0.001 mg/Kg	0.000031 mg/Kg	0.00015 mg/Kg
alpha-BHC*	319-84-6	0.01 mg/Kg	0.002 mg/Kg	0.00025 mg/Kg	0.001 mg/Kg	0.000021 mg/Kg	0.0001 mg/Kg
beta-BHC	319-85-7	0.01 mg/Kg	0.002 mg/Kg	0.00025 mg/Kg	0.001 mg/Kg	0.000052 mg/Kg	0.00025 mg/Kg
delta-BHC	319-86-8	0.01 mg/Kg	0.002 mg/Kg	0.00025 mg/Kg	0.001 mg/Kg	0.000030 mg/Kg	0.00015 mg/Kg
gamma-BHC	58-89-9	0.01 mg/Kg	0.002 mg/Kg	0.00025 mg/Kg	0.001 mg/Kg	0.000010 mg/Kg	0.00005 mg/Kg
alpha-Chlordane	5103-71-9	0.01 mg/Kg	0.002 mg/Kg	0.00025 mg/Kg	0.001 mg/Kg	0.000027 mg/Kg	0.00013 mg/Kg
gamma-Chlordane	5103-74-2	0.01 mg/Kg	0.002 mg/Kg	0.00025 mg/Kg	0.001 mg/Kg	0.000031 mg/Kg	0.00015 mg/Kg
Chlordane (technical)*	57-74-9	0.1 mg/Kg	0.02 mg/Kg	0.001 mg/Kg	0.005 mg/Kg	0.0002 mg/Kg	0.008 mg/Kg
4, 4' DDD*	72-54-8	0.01 mg/Kg	0.002 mg/Kg	0.00025 mg/Kg	0.001 mg/Kg	0.000116 mg/Kg	0.00058 mg/Kg
4, 4' DDE*	72-55-9	0.01 mg/Kg	0.002 mg/Kg	0.00025 mg/Kg	0.001 mg/Kg	0.000064 mg/Kg	0.00032 mg/Kg
4, 4' DDT*	50-29-3	0.01 mg/Kg	0.002 mg/Kg	0.00025 mg/Kg	0.001 mg/Kg	0.000092 mg/Kg	0.00046 mg/Kg

[1]Analytical method MDLs and QLs documented in validated methods. QLs are usually 3-10 times higher than the MDLs.
[2]Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method.

Medium/Matrix: Fish Tissue
Matrix Code (from OPTIONAL DQO Summary Form):
Analytical Parameter: Organic – Aroclors/Pesticides
Concentration Level: Low
Field Analytical or Fixed Laboratory Method/SOP[1]: L-2

Contaminants of Concern and Other Target Analytes Table (Reference Limit and Evaluation Table)

Analyte	CAS Number	Project Action Limit (Units) (wet weight)	Project Quantitation Limit (Units) (wet weight)	Analytical Method		Achievable Laboratory Limits	
				MDLs[1]	Method QLs[1]	MDLs[2]	QLs[2]
Dieldrin*	60-57-1	0.01 mg/Kg	0.002 mg/Kg	0.00025 mg/Kg	0.001 mg/Kg	0.000028 mg/Kg	0.00014 mg/Kg
Endosulfan I	959-98-8	0.01 mg/Kg	0.002 mg/Kg	0.00025 mg/Kg	0.001 mg/Kg	0.000022 mg/Kg	0.00011 mg/Kg
Endosulfan II	33212-65-9	0.01 mg/Kg	0.002 mg/Kg	0.00025 mg/Kg	0.001 mg/Kg	0.000098 mg/Kg	0.00049 mg/Kg
Endosulfan sulfate	1031-078	0.01 mg/Kg	0.002 mg/Kg	0.00025 mg/Kg	0.001 mg/Kg	0.000044 mg/Kg	0.00022 mg/Kg
Endrin*	72-20-8	0.01 mg/Kg	0.002 mg/Kg	0.00025 mg/Kg	0.001 mg/Kg	0.000061 mg/Kg	0.0003 mg/Kg
Endrin Aldehyde	7421-93-4	0.01 mg/Kg	0.002 mg/Kg	0.00025 mg/Kg	0.001 mg/Kg	0.000135 mg/Kg	0.00067 mg/Kg
Endrin Ketone	53494-70-5	0.01 mg/Kg	0.002 mg/Kg	0.00025 mg/Kg	0.001 mg/Kg	0.000061 mg/Kg	0.0003 mg/Kg
Heptachlor	76-44-8	0.01 mg/Kg	0.002 mg/Kg	0.00025 mg/Kg	0.001 mg/Kg	0.000023 mg/Kg	0.00012 mg/Kg
Heptachlor Epoxide*	1024-57-3	0.01 mg/Kg	0.002 mg/Kg	0.00025 mg/Kg	0.001 mg/Kg	0.000043 mg/Kg	0.00021 mg/Kg
Methoxychlor*	72-43-5	0.5 mg/Kg	0.2 mg/Kg	0.0005 mg/Kg	0.002 mg/Kg	0.000180 mg/Kg	0.0009 mg/Kg

[1]Analytical method MDLs and QLs documented in validated methods. QLs are usually 3-10 times higher than the MDLs.
[2]Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method.

Medium/Matrix: Fish Tissue
Matrix Code (from OPTIONAL DQO Summary Form):
Analytical Parameter: Organic – Aroclors/Pesticides
Concentration Level: Low
Field Analytical or Fixed Laboratory Method/SOP[1]: L-2

Contaminants of Concern and Other Target Analytes Table (Reference Limit and Evaluation Table)

Analyte	CAS Number	Project Action Limit (Units) (wet weight)	Project Quantitation Limit (Units) (wet weight)	Analytical Method		Achievable Laboratory Limits	
				MDLs[1]	Method QLs[1]	MDLs[2]	QLs[2]
Toxaphene*	8001-35-2	0.5 mg/Kg	0.2 mg/Kg	0.0025 mg/Kg	0.01 mg/Kg	0.0025 mg/Kg	0.01 mg/Kg
Aroclor-1016*	12674-11-2	0.5 mg/Kg	0.2 mg/Kg	0.0025 mg/Kg	0.01 mg/Kg	0.0018 mg/Kg	0.009 mg/Kg
Aroclor-1221*	11104-28-2	0.5 mg/Kg	0.2 mg/Kg	0.0025 mg/Kg	0.01 mg/Kg	0.002 mg/Kg	0.01 mg/Kg
Aroclor-1232*	11141-16-5	0.5 mg/Kg	0.2 mg/Kg	0.0025 mg/Kg	0.01 mg/Kg	0.002 mg/Kg	0.01 mg/Kg
Aroclor-1242*	53469-21-9	0.5 mg/Kg	0.2 mg/Kg	0.0025 mg/Kg	0.01 mg/Kg	0.002 mg/Kg	0.01 mg/Kg
Aroclor-1248*	12672-29-6	0.5 mg/Kg	0.2 mg/Kg	0.0025 mg/Kg	0.01 mg/Kg	0.002 mg/Kg	0.01 mg/Kg
Aroclor-1254*	11097-69-1	0.5 mg/Kg	0.2 mg/Kg	0.0025 mg/Kg	0.01 mg/Kg	0.002 mg/Kg	0.01 mg/Kg
Aroclor-1260*	11096-82-5	0.5 mg/Kg	0.2 mg/Kg	0.0025 mg/Kg	0.01 mg/Kg	0.0019 mg/Kg	0.009 mg/Kg
Aroclor-1262*	11100-14-4	0.5 mg/Kg	0.2 mg/Kg	0.0025 mg/Kg	0.01 mg/Kg	0.002 mg/Kg	0.01 mg/Kg

[1]Analytical method MDLs and QLs documented in validated methods. QLs are usually 3-10 times higher than the MDLs.
[2]Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method.

Medium/Matrix: Fish Tissue
Matrix Code (from OPTIONAL DQO Summary Form):
Analytical Parameter: Inorganic – Mercury
Concentration Level: Low
Field Analytical or Fixed Laboratory Method/SOP[1]: L-1

Contaminants of Concern and Other Target Analytes Table (Reference Limit and Evaluation Table)

Analyte	CAS Number	Project Action Limit (Units) (wet weight)	Project Quantitation Limit (Units) (wet weight)	Analytical Method		Achievable Laboratory Limits	
				MDLs[1]	Method QLs[1]	MDLs[2]	QLs[2]
Mercury (total)*	7439-97-6	200 μg/Kg	40 μg/Kg	0.2 μg/Kg	1 μg/Kg	0.08 μg/Kg	0.4 μg/Kg

[1]Analytical method MDLs and QLs documented in validated methods. QLs are usually 3-10 times higher than the MDLs.
[2]Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method.

Analytical Services Table

Medium/ Matrix	Analytical Parameter	Concentration Level	Analytical Method/SOP	Data Package Turnaround Time	Laboratory/Organization (Name and Address: Contact Person and Telephone Number)	Backup Laboratory/Organization (Name and Address: Contact Person and Telephone Number)
Fish Tissue	Aroclors/ Pesticides	Low	L-2	28 days	ELM Laboratories, Cheddar, VT Jasper Sanquin, 690-642-1720	N/A
Fish Tissue	Mercury	Low	L-1	28 days	ELM Laboratories, Cheddar, VT Jasper Sanquin, 690-642-1720	N/A

Project Schedule Timeline Table

Activities	Dates (MM/DD/YY)		Deliverable	Deliverable Due Date
	Anticipated Date(s) of Initiation	Anticipated Date of Completion		
QAPP Preparation	3/13/00	4/13/00	QAPP Document	4/17/00
Fixed Laboratory Technical Systems Audit	4/24/00	4/24/00	TSA Report	5/8/00
Fish Collection	6/16/00	9/4/00	All Fish Samples to Laboratory	9/4/00
Field Sampling Technical Systems Audit	6/16/00-6/23/00	6/23/00	TSA Report	7/6/00
Fish Processing	6/17/00	9/5/00	All Fish Samples Processed	9/5/00
Laboratory Analysis	6/26/00	10/2/00	Data Package	10/2/00
Data Validation	7/30/00	10/30/00	Data Validation Reports	10/30/00
Data Usability Assessment	10/2/00	11/30/00	Data Usability Assessment Report	12/1/00
Risk Assessment	12/4/00	1/3/01	Risk Assessment Report	1/3/01
Final Project Report Preparation	1/4/01	2/4/01	Final Project Report	2/4/01

Measurement Performance Criteria Table

Medium/Matrix	Fish Tissue
Analytical Parameter	Organics - Aroclors/ Pesticides
Concentration Level	Low

Sampling Procedure	Analytical Method/SOP	Data Quality Indicators (DQIs)[1]	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
S-1	L-2	Precision - Lab	RPD $\leq$ 40%	Laboratory Duplicates	A
		Accuracy/Bias	$\pm$ 20% recovery	QC Standard 2nd Source/SRM	A
		Accuracy/Bias-Contamination	No target compounds $\geq$ QL	Method Blanks*, Instrument Blanks	A
		Sensitivity	$\pm$ 40% recovery at QL	Laboratory Fortified Blank at QL	A
		Completeness	> 85% fish collection, > 90% laboratory analysis	Data Completeness Check	S&A

[1]**Data Quality Indicators (a.k.a. PARCC parameters, i.e., precision, accuracy/bias, sensitivity, data completeness, comparability)**

***Method Blanks will be prepared in analyte-free Ottawa Sand by ELM Laboratories at a frequency of one per processing batch of 20 samples per preparation technique per analysis day. Method Blanks will be carried through all fish processing, preparation, and analysis tasks.**

Measurement Performance Criteria Table

Medium/Matrix	Fish Tissue
Analytical Parameter	Inorganics - Mercury
Concentration Level	Low

Sampling Procedure	Analytical Method/SOP	Data Quality Indicators (DQIs)[1]	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
S-1	L-1	Precision-Lab	RPD $\leq$ 20%	Laboratory Duplicates	A
		Accuracy/Bias	$\pm$ 15% recovery	QC Standard 2nd Source/SRM	A
		Accuracy/Bias-Contamination	No target compounds $\geq$ QL	Preparation Blanks*	A
		Sensitivity	$\pm$ 40% recovery at QL	Laboratory Fortified Blank at QL	A
		Completeness	> 85% fish collection, > 90% laboratory analysis	Data Completeness Check	S&A

[1]**Data Quality Indicators (a.k.a. PARCC parameters, i.e., precision, accuracy/bias, sensitivity, data completeness, comparability)**

***Preparation Blanks will be prepared in analyte-free Ottawa Sand by ELM Laboratories at a frequency of one per processing batch of 20 samples per preparation technique per analysis day. Preparation Blanks will be carried through all fish processing, preparation, and analysis tasks.**

Sampling Design and Rationale

SAMPLING PROCESS DESIGN

Sampling Design Rationale

Fish sampling will consist of collecting fish from six different reaches of the Connecticut River Watershed. Sampling segment boundaries were selected based on documented water quality issues and threatened resources. Sampling will be initiated in the southernmost locations first and move north. Target fish species will be collected using gill nets, electrofishing, rod and reel, fyke nets, or other appropriate methods. Samples of resident fishes, which include yellow perch with white perch as the alternate target species, smallmouth bass with largemouth bass or walleye as the alternate target species and white sucker with white catfish as the alternate target species will consist of five 3-fish fillet and offal composites of each species from all sampling reaches as described above. Samples of American Shad and Striped Bass will also consist of five 3-fish fillet and offal composites, but Blueback Herring will consist of five 3-whole fish composites. The anadromous fish species, American Shad, Striped Bass and Blueback Herring, will only be collected in Reach 3. EBT will only be collected in Reach 6 and will consist of five 3-fish fillet and offal composites. The sampling period will begin in June for collection of the pre-spawning anadromous species and the remainder of the reaches will be sampled during July and August. Fifteen fish (five 3-fish composites) from each species will be the target number within a similar age. Yellow perch or white perch will be selected in a size ranging between 7 to 9 inches. Smallmouth bass or largemouth bass or walleye will be selected in a size ranging from 12 to 14 inches, and white sucker or white catfish will be selected in a size ranging from 12 to 16 inches. Eastern brook trout will be selected in a size ranging from 5 to 7 inches. American shad will be selected in a size ranging from 17 to 20 inches, and striped bass will be selected in a size ranging from 28 to 30 inches, and Blueback herring from 8 to 10 inches.

Whole fish samples will be shipped on ice to ELM Laboratories within 12 hours of collection. Whole fish samples will be processed immediately upon receipt by the laboratory. Sample processing will consist of scaling fresh fish and leaving the skin on, filleting the fish, and combining similar age/weight/size classes of an individual species for human health concerns (edibility), and separate collection of the remaining offal. Samples of the resident fish species will consist of five 3-fish fillet and offal composites. Samples of the Eastern brook trout and American shad and Striped Bass will consist of five 3-fish fillet and offal composites. The sample for blueback herring will consist of five 3-whole fish composites. The offal composites will be used to calculate whole fish contaminant levels to evaluate potential ecological receptors through the development of food chain models. Processed composite samples will be immediately frozen at < -20°C and frozen composite samples must be prepared and analyzed within a maximum of 1 year of collection for Aroclors/Pesticides and 28 days of collection for Mercury. Within 12 hours of thawing, composite samples will be prepared for analysis (extracted/digested). Instrumental analysis of extracts/digestates will immediately follow. Archival of remaining processed composite sample material and remaining extract/digestate material will be for 16 months from sample receipt.

Sampling Locations and Sampling and Analysis Method/SOP Requirements Table

Sampling Location	Location ID Number	Medium/ Matrix	Depth (units)	Analytical Parameter	Concentration Level	Number of Samples (identify field duplicates and replicates)	Sampling SOP	Analytical Method/ SOP	Sample Volume	Containers (number, size and type)	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation/ analysis)
Connecticut River	1	Fish	N/A	Aroclors/ Pesticides	Low	45 Fish (3 fish/species, 5 replicate/species, 3 species) separate fillet & offal samples	S-1	L-2	150 grams minimum	8 oz. wide mouth glass amber	Homogenize, freeze @ <-20^{N}C	See Worksheet #12a
				Mercury	Low	45 Fish (3 fish/species, 5 replicate/species, 3 species) separate fillet & offal samples	S-1	L-1	10 grams minimum	2 oz. wide mouth glass amber	Homogenize, freeze @ <-20^{N}C	See Worksheet #12a
Connecticut River	2	Fish	N/A	Aroclors/ Pesticides	Low	45 Fish (3 fish/species, 5 replicate/species, 3 species) separate fillet & offal samples	S-1	L-2	150 grams minimum	8 oz. wide mouth glass amber	Homogenize, freeze @ <-20^{N}C	See Worksheet #12a
				Mercury	Low	45 Fish (3 fish/species, 5 replicate/species, 3 species) separate fillet & offal samples	S-1	L-1	10 grams minimum	2 oz. wide mouth glass amber	Homogenize, freeze @ <-20^{N}C	See Worksheet #12a
Connecticut River	3	Fish	N/A	Aroclors/ Pesticides	Low	75 Fish (3 fish/species, 5 replicate/species, 6 species) separate fillet & offal samples — — — — — — — — 15 whole-bodied fish (B)	S-1	L-2	150 grams minimum	8 oz. wide mouth glass amber	Homogenize, freeze @ <-20^{N}C	See Worksheet #12a
				Mercury	Low	75 Fish (3 fish/species, 5 replicate/species, 6 species) separate fillet & offal samples — — — — — — — — 15 whole-bodied fish (B)	S-1	L-1	10 grams minimum	2 oz. wide mouth glass amber	Homogenize, freeze @ <-20^{N}C	See Worksheet #12a
Connecticut River	4	Fish	N/A	Aroclors/ Pesticides	Low	45 Fish (3 fish/species, 5 replicate/species, 3 species) separate fillet & offal samples	S-1	L-2	150 grams minimum	8 oz. wide mouth glass amber	Homogenize, freeze @ <-20^{N}C	See Worksheet #12a

Sampling Locations and Sampling and Analysis Method/SOP Requirements Table

Sampling Location	Location ID Number	Medium/ Matrix	Depth (units)	Analytical Parameter	Concentration Level	Number of Samples (identify field duplicates and replicates)	Sampling SOP	Analytical Method/ SOP	Sample Volume	Containers (number, size and type)	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation/ analysis)
				Mercury	Low	45 Fish (3 fish/species, 5 replicate/species, 3 species) separate fillet & offal samples	S-1	L-1	10 grams minimum	2 oz. wide mouth glass amber	Homogenize, freeze @ <-20^{N}C	See Worksheet #12a
Connecticut River	5	Fish	N/A	Aroclors/ Pesticides	Low	45 Fish (3 fish/species, 5 replicate/species, 3 species) separate fillet & offal samples	S-1	L-2	150 grams minimum	8 oz. wide mouth glass amber	Homogenize, freeze @ <-20^{N}C	See Worksheet #12a
				Mercury	Low	45 Fish (3 fish/species, 5 replicate/species, 3 species) separate fillet & offal samples	S-1	L-1	10 grams minimum	2 oz. wide mouth glass amber	Homogenize, freeze @ <-20^{N}C	See Worksheet #12a
Connecticut River	6	Fish	N/A	Aroclors/ Pesticides	Low	60 Fish (3 fish/ species, 5 replicate/ species, 3 species) separate fillet & offal samples	S-1	L-2	150 grams minimum	8 oz. wide mouth glass amber	Homogenize, freeze @ <-20^{N}C	See Worksheet #12a
				Mercury	Low	60 Fish (3 fish/species, 5 replicate/species, 3 species) separate fillet & offal samples	S-1	L-1	10 grams minimum	2 oz. wide mouth glass amber	Homogenize, freeze @ <-20^{N}C	See Worksheet #12a

Table 1. Types, Reaches, and Total Number of Fish to be Caught

Reach	Target Species (alternate)	Target Length (inches)	Total Fish to Catch	Total # Composites (3 Fish/Composite)			# Analyses	
				Fillet	Offal	Whole-Bodied	Aroclors/ Pesticides	Hg
1	YP (WP)	7-9	15	5	5	0	10	10
	SMB (LMB)	12-14	15	5	5	0	10	10
	WS (WC)	12-16	15	5	5	0	10	10
2	YP (WP)	7-9	15	5	5	0	10	10
	SMB (LMB)	12-14	15	5	5	0	10	10
	WS (WC)	12-16	15	5	5	0	10	10
3	YP (WP)	7-9	15	5	5	0	10	10
	SMB (LMB)	12-14	15	5	5	0	10	10
	WS (WC)	12-16	15	5	5	0	10	10
	AS	17-20	15	5	5	0	10	10
	SB	28-30	15	5	5	0	10	10
	B	8-10	15	0	0	5	5	5
4	YP (WP)	7-9	15	5	5	0	10	10
	SMB (LMB)	12-14	15	5	5	0	10	10
	WS (WC)	12-16	15	5	5	0	10	10
5	YP (WP)	7-9	15	5	5	0	10	10
	SMB (LMB)	12-14	15	5	5	0	10	10
	WS (WC)	12-16	15	5	5	0	10	10
6	YP (WP)	7-9	15	5	5	0	10	10
	SMB (LMB)	12-14	15	5	5	0	10	10
	WS (WC)	12-16	15	5	5	0	10	10
	EBT	5-7	15	5	5	0	10	10
						TOTAL	215	215

Project Sampling SOP Reference Table

Reference Number	Title, Revision Date and/or Number	Originating Organization	Equipment Identification	Modified for Project Work Y or N	Comments
S-1	Standard Operating Procedures for Collection of Free Swimming Aquatic Fauna	Brown Engineering	N/A	N	Includes descriptions and procedures for a variety of techniques for fish collection.
S-2	Standard Operating Procedures for Field Sample Packaging and Transport	Brown Engineering	N/A	N	Includes sample packaging, shipping, and chain-of-custody requirements
S-3					
S-4					
S-5					
S-6					
S-7					
S-8					

Field Equipment Maintenance, Testing, and Inspection Table

Sampling Equipment/ Instrument	Maintenance Activity	Testing Activity	Inspection Activity	Responsible Person	Frequency	Acceptance Criteria	Corrective Action	SOP Reference
Shock boat engine			Check engine oil	Boat operator	Prior to each sampling event	At full level	Fill	S-1
Shock boat engine			Check cooling water discharge	Boat operator	Continuously during operation	Cooling water is discharging	Clear debris/replace or fix pump	S-1
Shock boat engine			Check fuel level	Boat operator	Prior to leaving on survey	Enough fuel for survey and return trip with 1/3 fuel left in reserve	Fill tanks	S-1
Shock boat		Check bilge pump		Boat operator	Prior to survey and intermittently during survey operation	Pump works	Fix or replace pump	S-1
Shock boat		Check freshwater intake pump		Boat operator	Before leaving landing area or dock, upon start up of generator, when filling live wells, and continuously while operating shock boat	Pump in good working order	Fix or replace pump	S-1
Shock boat		Check holding well recirculating pump		Boat operator	Prior to departure from dock/landing area	Pump in good working order	Fix or replace pump	S-1
Shock boat		Check Thru-Hull		Boat operator	Before off loading boat and upon return	No visible damage or clogged debris on intake	Clean out, repair as necessary	S-1
Shock boat			Check Sea Strainer	Boat operator	Continuously during operation	Strainer free and clear of debris	Clean out, repair as needed	S-1

Field Equipment Maintenance, Testing, and Inspection Table

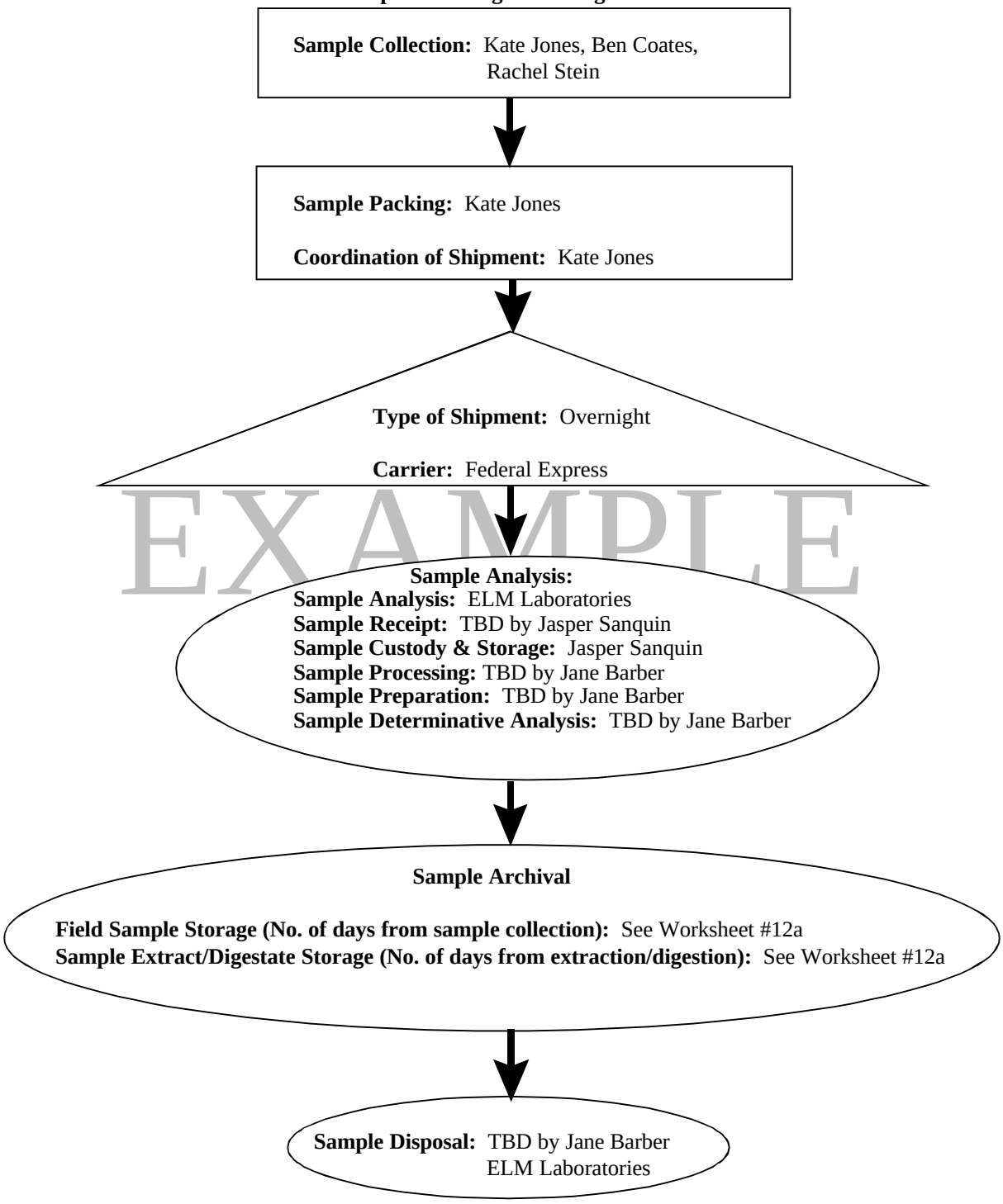
Sampling Equipment/ Instrument	Maintenance Activity	Testing Activity	Inspection Activity	Responsible Person	Frequency	Acceptance Criteria	Corrective Action	SOP Reference
Shock boat		Navigation Lights		Boat operator	Prior to leaving on survey	Working	Replace bulb, repair wiring	S-1
Shock boat		Holding tank lights		Boat operator	Prior to leaving on survey	Working	Replace bulb, repair wiring	S-1
Shock boat		Holding tank flood lights		Boat operator	Prior to leaving on survey	Working	Replace bulb, repair wiring	S-1
Shock boat		Work-up lights		Boat operator	Prior to leaving on survey	Working	Replace bulb, repair wiring	S-1
Shock boat		Work-up flood lights		Boat operator	Prior to leaving on survey	Working	Replace bulb, repair wiring	S-1
Shock boat trailer			Trailer lights	Boat operator	All lights & signals are working	Working	Replace bulb, repair wiring	S-1
Shock boat trailer	Wheel bearings & rollers lubricated			Boat operator	Twice per season	Completed	Grease bearings	S-1
Shock boat trailer			Winch	Boat operator	Prior to leaving on survey	Good working condition	Fix or replace	S-1
Shock boat trailer			Winch drawn tight to boat	Boat operator	Prior to leaving on survey	Boat drawn tight against roller block	Winch tight	S-1
Shock boat trailer			Breakaway chain hooked on boat	Boat operator	Prior to leaving on survey	Chain hooked on boat	Hook up chain	S-1

Field Equipment Maintenance, Testing, and Inspection Table

Sampling Equipment/ Instrument	Maintenance Activity	Testing Activity	Inspection Activity	Responsible Person	Frequency	Acceptance Criteria	Corrective Action	SOP Reference
Shock boat trailer			Belly strap hooked on trailer and over boat	Boat operator	Prior to leaving on survey	Belly strap securely holding boat on trailer	Cinch down belly strap	S-1
Shock boat trailer			Trailer secured to ball hitch	Boat operator	Prior to leaving on survey	Trailer is secure	Secure	S-1
Shock boat trailer			Spare trailer tire properly inflated, key for lock, lug wrench and jack all on hand	Boat operator	Prior to leaving on survey	All on hand for survey operation	Repair/find	S-1
Shock boat generator	Check oil level			Boat operator	Prior to operation	Oil level full	Fill	S-1
Shock boat generator	Cooling water discharge			Boat operator	Continuously during operation	Water is discharging	Check intake/ pump, fix or replace	S-1

* Specify appropriate reference letter/number from the Project Sampling SOP Reference Table (see OPTIONAL QAPP Worksheet #13).

Sample Handling Flow Diagram



SAMPLE CUSTODY

Sample custody, or chain-of-custody, protocols are in three parts: (1) sample collection, (2) laboratory analysis, and (3) final evidence files.

A sample or evidence file is considered under custody if:

- Sample or file is in possession,
- Sample or file is in view, and
- Sample or file is placed in a designated secure area after being properly sealed to prevent tampering.

Field Chain-of-Custody Procedures

The sample packaging and shipment procedures summarized below ensure that the samples will arrive at the laboratory with the chain-of-custody intact. The protocols for specific sample numbering and other sample designations are included in Section 2.1.1 of the Field Sampling Plan.

Field Procedures

The field sampler will be personally responsible for the care and custody of the samples until the samples are transferred or properly dispatched. As few people as possible will handle the samples.

All sample bottles will be tagged or labeled with sample identification numbers and locations, including time and date of sample collection. Sample tags or labels will be completed for each sample using a permanent, waterproof ink either prior to or immediately after sample collection.

The Project Manager will review all field activities to determine whether proper custody procedures were followed during the field work and decide if additional samples are required.

Field Logbooks/Documentation

The field logbook will provide the means of recording data collection activities performed. As such, logbook entries will be described in as much detail as possible so that particular site activities could be re-constructed without reliance on memory.

Field logbooks will be bound logbooks, field survey books or notebooks. Logbooks will be assigned to field personnel, but will be stored in the document control center when not in use. Each logbook will be identified by a project-specific document number. The title page of each logbook will contain the following information:

- Person to whom the logbook is assigned,
- Logbook number,
- Project name,
- Project start date, and
- Project end date.

Entries into the logbook will contain a variety of information. The beginning of each entry will include: the date, start time, weather conditions, names of all sampling team members present, level of personal protection being used, and the signature of the person making the entry. The names of visitors to the site (including additional field sampling or investigative team personnel), and the purpose of their visit will also be recorded in the field logbook.

Measurements made and samples collected will be recorded in the field logbook. All entries will be made in ink and no erasures will be made. If an incorrect entry is made, the incorrect information will be crossed-out with a single strike mark and initialed. Whenever a sample is collected, or a measurement is made, a detailed description of the location of the station (which includes compass and distance measurements) will be recorded in the logbook. The number of photographs taken at the station, if any, will also be noted. The logbook will identify all equipment used to made measurements, along with the date of calibration.

Samples will be collected in accordance with the sampling procedures documented in the Field Sampling Plan. The equipment used to collect samples will be noted, along with the time of sampling, sample description, depth of sample collection, volume, and the number of sample containers. The corresponding sample identification number will be prominently listed.

Transfer of Custody and Shipment Procedures

The following procedures will be incorporated for the transfer of sample custody and sample shipment:

Samples are accompanied by a properly completed chain-of-custody form (see page 40). The sample identification numbers and locations will be listed on the chain-of-custody record. The custody record will be signed by the sampler. The chain-of-custody form will document the transfer of guardianship of samples from the sampler to another person, to a mobile laboratory, to the permanent laboratory, or to/from a secure storage area. Upon transferring the possession of samples, the individuals relinquishing and receiving the samples will sign, date, and note the time on the custody form.

Samples will be properly packaged for shipment and dispatched to the appropriate laboratory for analysis, with a separate signed custody record enclosed in each sample cooler. Shipping coolers will be secured with strapping tape and tamper-proof custody seals (see page 39) for shipment to the

laboratory. The tamper-evident custody seal will be attached to the front right and back left of the cooler. The custody seals are covered with clear plastic tape. The cooler will be strapped shut with strapping tape in at least two locations.

Whenever samples are located with a source or government agency, a separate Sample Receipt is prepared for those samples and marked to indicate with whom the samples are being co-located. The person relinquishing the samples to the facility or agency should request the representatives signature acknowledging sample receipt. If the representative is unavailable or refuses, this should be noted in the "Received By" space.

All shipments will be accompanied by the chain-of-custody record identifying the contents. The original record will accompany the shipment, and the pink copy will be retained by the sampler for returning to the sampling office.

If the samples are sent by common carrier, a bill of lading will be used. Receipts of bills of lading will be retained as part of the permanent documentation. If sent by mail, the package will be registered with return receipt requested. Commercial carriers are not required to sign off on the custody form as long as the custody forms are sealed inside the sample cooler and the custody seals remain intact.

Laboratory Chain Of Custody Procedures

Laboratory custody procedures for sample receiving and log in; sample storage; tracking during sample preparation and analysis; and storage of analytical data are described below:

Samples submitted to the Laboratory will be accompanied by a chain-of-custody form. The chain-of-custody forms will be completed and sealed within the sample transport container, which will be opened and examined by the Laboratory Sample Custodian. The Laboratory Sample Custodian will ensure that all entries on the chain-of-custody form correspond with the sample label. If discrepancies are noted by the Laboratory Sample Custodian, Versar staff will be contracted to resolve any conflicting information.

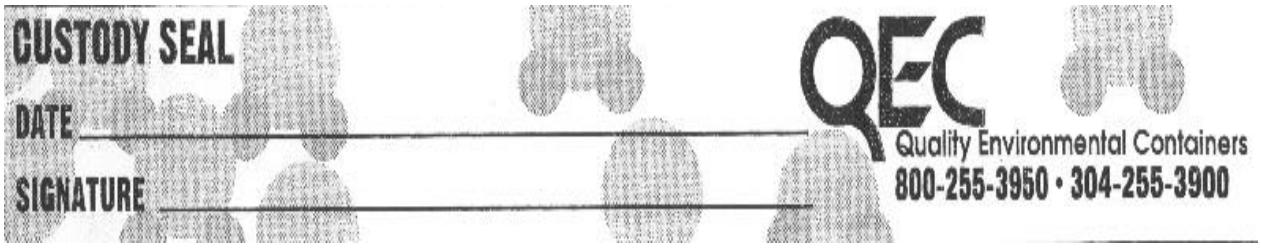
Evidentiary documentation procedures will be implemented by the Laboratory. The designated Laboratory Sample Custodian will receive and document all samples submitted to the Laboratory. The Laboratory Custodian will examine the condition, preservation, and accompanying documentation of all submitted samples prior to approval and formal acceptance by the Laboratory. Any sample, preservation, or documentation discrepancies (i.e., broken sample container, improper preservation, inadequate sample volume, or poor documentation) will be resolved before the sample is approved and formally accepted for analyses. All required acceptance data will be recorded and documented in the Laboratory Sample Log and Laboratory Computerized Data Management System. The sample will be labeled with Laboratory identification information and placed in the secure sample storage area prior to distribution to the appropriate analyst(s).

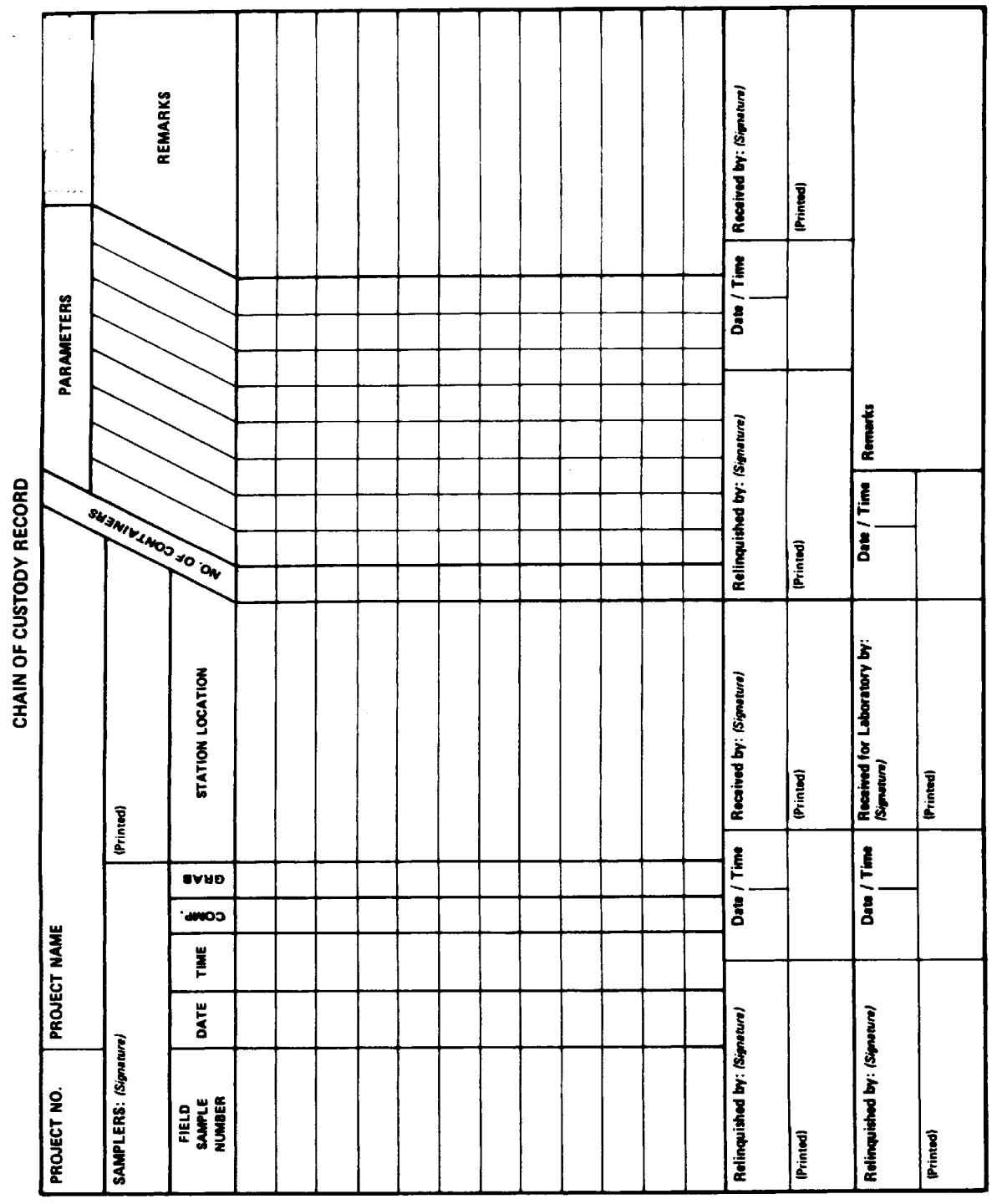
Once the sample has been officially entered into the Laboratory computer system, the computer generates individual sample sheets. These sample sheets contain all pertinent information relevant to the sample. The sample record will be put into the Sample Control Logbook, which is located in the Sample Receiving Area. The analyst(s) will sign out samples from the Sample Receiving Area by entering their initials, date, and time of sample removal into the logbook. The sample will be taken to the appropriate laboratory section and logged into the analyst's Sample Control Record. Any time the sample or extract is removed from or returned to the refrigerator, the pertinent information (analyst initials, date, and time) will be recorded into the logbook. The sample or extract will remain in the refrigerator or storage area until it is time to dispose of it. At that time, disposal information will also be recorded on the Sample Control Record.

Final Evidence Files Custody Procedures

The evidence files for the project are maintained at the Brown Engineering office. The content of the evidence file will include all relevant records, reports, correspondence, logs, field logbooks, laboratory sample preparation and analysis logbooks, data package, pictures, subcontractor reports, chain of custody records, data review reports, etc. The evidence file will be under custody of the contractor project manager in a locked, secured area. Evidence files of analytical data will also be retained by the selected contract laboratory for a minimum of seven years.

SAMPLE CUSTODY SEAL




CHAIN OF CUSTODY RECORD
PROJECT NO.
PROJECT NAME
PARAMETERS
SAMPLERS: (Signature)
(Printed)
NO. OF CONTAINERS
REMARKS
FIELD SAMPLE NUMBER
DATE
TIME
COMP.
GRAB
STATION LOCATION
Relinquished by: (Signature)
Date / Time
Received by: (Signature)
Relinquished by: (Signature)
Date / Time
Received by: (Signature)
(Printed)
(Printed)
(Printed)
(Printed)
Relinquished by: (Signature)
Date / Time
Received for Laboratory by: (Signature)
Date / Time
Remarks
(Printed)
(Printed)
Distribution: Original Plus One Accompanies Shipment (white and yellow); Copy to Coordinator Field Files (pink).

Field Analytical Method/SOP Reference Table

Reference Number	Title, Revision Date, and/or Number	Definitive or Screening Data	Originating Organization	Analytical Parameter	Instrument	Organization Performing Field Analysis	Modified for Project Work Y or N
F-1	Standard Operating Procedures for Calibration and Use of Field Instruments, June 3, 1999	Definitive	Brown Engineering	pH	YSI 600 XLM	Brown Engineering	N
				Dissolved oxygen	YSI 600 XLM	Brown Engineering	N
				Temperature	YSI 600 XLM	Brown Engineering	N
				Specific conductance	YSI 600 XLM	Brown Engineering	N

Field Analytical Instrument Calibration Table

Instrument	Activity	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	Method/SOP Reference
YSI 600 XLM pH probe	Calibrate probe with 3 temp. equilibrated stds. to bracket expected pH values	Daily before use; Calibration check every 4 hours of use and at end of day	3 stds. provide stable readings $\pm$ 0.1 pH unit within 3 min.	If probe reading fails to stabilize, do not use. Check/replace membrane and recalibrate or service as necessary. Repeat analysis of affected samples or qualify data if analysis cannot be repeated.	Project lead: Kate Jones	F-1
YSI 600 XLM Dissolved Oxygen Probe	Calibrate with 2 stds - % Saturated DO std. and 0.0 mg/L DO std.	Daily before use; Calibration check every 4 hours of use and at end of day	$\pm$ 0.2 mg/L for 0.0 mg/L DO std.	If DO reading exceeds criterion, then prepare new 0.0 mg/L DO std., clean probe and/or change membrane. Recalibrate or service as necessary. Repeat analysis of affected samples or qualify data if analysis cannot be repeated.	Project lead: Kate Jones	F-1
YSI 600 XLM Conductivity Probe	Calibrate electrode with 1 std.	Daily before use; Calibration check at end of day	$\pm$ 1 μmho/cm of std.	If sp. conductance reading exceeds criterion, then clean probe or service as necessary and recalibrate. Repeat analysis of affected samples or qualify data if analysis cannot be repeated.	Project lead: Kate Jones	F-1
YSI 600 XLM Temperature Sensor	Calibrate against NIST certified thermometer	Daily before use; Calibration check at end of day	$\pm$ 0.15°C of NIST certified thermometer	If temperature sensor reading exceeds criterion, service or replace as necessary and recalibrate. Repeat analysis of affected samples or qualify data if analysis cannot be repeated.	Project lead: Kate Jones	F-1

Field Analytical Instrument/Equipment Maintenance, Testing, and Inspection Table

Instrument	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	Method/SOP Reference*
YSI 600 XLM pH probe	Check mechanical and electronic parts, verify system continuity, check battery, and clean probe.			Daily before use and when unstable readings occur	Stable after 3 min.	Clean probe, and/or replace membrane, and/or replace or service other defective parts. Back-up instrument stored in field trailer on-site.	Kate Jones	F-1
		Calibration check		After daily calibration, every 4 hours of use, and at end of day	± 0.1 pH unit within 3 min.			
			Visual inspection	Daily before use	No defective parts noted			
YSI 600 XLM Dissolved Oxygen Probe	See SOP F-1							F-1
YSI 600 XLM Conductivity	See SOP F-1							F-1
YSI 600 XLM Temperature Sensor	See SOP F-1							F-1

* Specify appropriate reference letter/number from Field Analytical Method/SOP Reference Table (see OPTIONAL QAPP Worksheet #17).

Fixed Laboratory Analytical Method/SOP Reference Table

Reference Number	Fixed Laboratory Performing Analysis	Title, Revision Date, and/or Number	Definitive or Screening Data	Analytical Parameter	Instrument	Modified for Project Work Y or N
L-1	ELM Laboratories	ELM Laboratories Standard Operating Procedure for Processing, Preparing and Analyzing Fish Samples by EPA Method 245.6	Definitive	Mercury	CVAAS	No
L-2	ELM Laboratories	ELM Laboratories Standard Operating Procedure for Processing, Preparing and Analyzing Fish Samples by NOAA NOS ORCA 130 Mussel Watch method	Definitive	Aroclors/ Pesticides	GC/ECD	No

Fixed Laboratory Instrument Maintenance and Calibration Table

Instrument	Activity	List Maintenance, Testing and Inspection Activities	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	Method/SOP Reference*
GC/ECD	Aroclor/Pesticide Analysis	Check connections, replace disposables, bake out instrument, recondition column, and perform leak tests	Initial calibration after instrument set up, then when daily 12-hour calibration verification criteria not met	For all target compounds, initial RSD $\leq$ 10% or R^2 >0.995; and calibration verification %D $\leq$15%	Inspect system; correct problem; re-run calibration and affected samples	Betty Smith	L-2
CVAAS	Mercury Analysis	Check connections, replace disposables, and flush lines	Calibration and initial calibration verification after instrument set up, then daily; continuing calibration verification 10% or every 2 hours, whichever is more frequent	Calibration R^2 >0.995; initial and continuing calibration verification $\pm$ 20% of true value	Inspect system; correct problem; re-run calibration and affected samples	Betty Smith	L-1

Fixed Laboratory Analytical QC Sample Table

Medium/Matrix	Fish Tissue
Sampling SOP	S-1
Analytical Parameter	Aroclors/Pesticides
Concentration Level	Low
Analytical Method/SOP Reference	L-2
Laboratory Name	ELM Laboratories
No. of Sample Locations	6

Fixed Lab QC:*	**Frequency/Number**	**Method/SOP QC Acceptance Limits**	**Corrective Action (CA)**	**Person(s) Responsible for CA**	**Data Quality Indicator (DQI)**	**Measurement Performance Criteria**
Method Blank	1/Extraction batch (20 samples)	No target compounds $\geq$ QL	If sufficient sample volume is available, re-extract and reanalyze affected samples. If insufficient amount of sample is available, reanalyze extracts. Qualify data as needed.	Betty Smith	Accuracy/Bias-Contamination	No target compounds $\geq$ QL
Instrument Blank	After initial calibration and every 12 hours	No target compounds $\geq$ ½ QL	Reanalyze affected sample extracts. Qualify data as needed.	Betty Smith	Accuracy/Bias-Contamination	No target compounds $\geq$ QL
Laboratory Duplicate	1/Extraction batch	RPD $\leq$ 40%	If sufficient sample volume is available, re-extract and reanalyze affected samples. If insufficient amount of sample is available, reanalyze extracts. Qualify data as needed.	Betty Smith	Precision	RPD $\leq$ 40%
2nd Source Standard/SRM	1/Extraction batch	All target compounds $\pm$ 20% recovery	If sufficient sample volume is available, re-extract and reanalyze affected samples. If insufficient amount of sample is available, reanalyze extracts. Qualify data as needed.	Betty Smith	Accuracy/Bias	All target compounds $\pm$ 20% recovery
LFB	1/Extraction batch prior to sample analysis	All target compounds $\pm$ 40% recovery at QL	If sufficient sample volume is available, re-extract and reanalyze affected samples. If insufficient amount of sample is available, reanalyze extracts. Qualify data as needed.	Betty Smith	Sensitivity	All target compounds $\pm$ 40% Recovery at QL
Surrogates	2 per sample	30-150% Recovery	Reanalyze affected sample extracts. Qualify data as needed.	Betty Smith	Accuracy/Bias	30-150% Recovery

* Insufficient sample for MS/MSD.

Fixed Laboratory Analytical QC Sample Table

Medium/Matrix	Fish Tissue
Sampling SOP	S-1
Analytical Parameter	Mercury
Concentration Level	Low
Analytical Method/SOP Reference	L-1
Laboratory Name	ELM Laboratories
No. of Sample Locations	6

Fixed Lab QC:*	**Frequency/Number**	**Method/SOP QC Acceptance Limits**	**Corrective Action (CA)**	**Person(s) Responsible for CA**	**Data Quality Indicator (DQI)**	**Measurement Performance Criteria**
Preparation	1/Preparation batch (20 samples)	No target compounds $\geq$ QL	If sufficient sample volume is available, re-extract and reanalyze affected samples. If insufficient amount of sample is available, reanalyze extracts. Qualify data as needed.	Betty Smith	Accuracy/Bias-Contamination	No target compounds $\geq$ QL
Laboratory Duplicate	1/Preparation batch	$\leq$ 20% RPD	If sufficient sample volume is available, re-extract and reanalyze affected samples. If insufficient amount of sample is available, reanalyze extracts. Qualify data as needed.	Betty Smith	Accuracy/Bias-Contamination	$\leq$ 20% RPD
2nd Source Standard/SRM	1/Preparation batch	$\pm$ 15% Recovery	If sufficient sample volume is available, re-extract and reanalyze affected samples. If insufficient amount of sample is available, reanalyze extracts. Qualify data as needed.	Betty Smith	Accuracy/Bias	$\pm$ 15% Recovery
LFB	1/Preparation batch prior to sample analysis	$\pm$ 40% Recovery at QL	If sufficient sample volume is available, re-extract and reanalyze affected samples. If insufficient amount of sample is available, reanalyze extracts. Qualify data as needed.	Betty Smith	Sensitivity	$\pm$ 40% Recovery at QL

* Insufficient sample for duplicate and spike.

Sampling SOP: S-2
Analytical Method/SOP: L-2

Fixed Laboratory Method/SOP Precision and Accuracy Table

Analyte	Achievable Laboratory Sensitivity/ Quantitation Limits	Analytical Precision	Analytical Accuracy/Bias
Aldrin	See Worksheet 9b	Laboratory duplicate RPD $\leq$ 40%	$\pm$ 20% Recovery in second source standard
alpha-BHC*	″	″	″
beta-BHC	″	″	″
delta-BHC	″	″	″
gamma-BHC	″	″	″
alpha-Chlordane	″	″	″
gamma-Chlordane	″	″	″
Chlordane (technical)*	″	″	″
4, 4' DDD*	″	″	″
4, 4' DDE*	″	″	″
4, 4' DDT*	″	″	″
Dieldrin*	″	″	″
Endosulfan I	″	″	″
Endosulfan II	″	″	″
Endosulfan sulfate	″	″	″
Endrin*	″	″	″
Endrin Aldehyde	″	″	″
Endrin ketone	″	″	″
Heptachlor	″	″	″
Heptachlor Epoxide*	″	″	″
Methoxychlor*	″	″	″
Toxaphene*	″	″	″

Sampling SOP: S-2
Analytical Method/SOP: L-1

Fixed Laboratory Method/SOP Precision and Accuracy Table

Analyte	Achievable Laboratory Sensitivity/ Quantitation Limits	Analytical Precision	Analytical Accuracy/Bias
Mercury (total)*	See Worksheet 9b	Laboratory duplicate RPD $\leq$ 20%	$\pm$ 15% Recovery in second source standard

Non-Direct Measurements Criteria and Limitations Table

Non-Direct Measurement (Secondary Data)	Data Source (Originating Organization, Report Title and Date)	Data Generator(s) (Originating Org., Data Types, Data Generation/Collection Dates)	How Data Will Be Used	Limitations on Data Use
River Water Quality	The Connecticut River Forum; The Health of the Watershed: A Report of the Connecticut River Forum; January 1998	The Connecticut River Forum; Description of water quality issues and recommendations; 1997.	River history information; Focus the study; Identify which reaches to sample; Decide species and size fish to collect	No description of fish processing, preparation, and analysis procedures used. No qualitative or quantitative comparisons will be performed using this data.
Policy and Planning	USEPA and State of Connecticut; 1993 Clean Water Strategy and 1994 Connecticut River Water Quality Assessment	USEPA and the State of Connecticut; Description of water quality issues and recommendations; 1985-1994.	Focus the study; Identify which reaches to sample; Decide species and size fish to collect	Not all reaches were samples. No qualitative or quantitative comparisons will be performed using this data.
Fish Tissue Data	State of Connecticut; 1994 Connecticut River Water Quality Assessment	USEPA and the State of Connecticut; Fish Tissue Analysis - Summary Table of Analytical Results; 1985.	Focus the study; Identify which reaches to sample	Not all reaches were sampled. No description of fish species and sizes. No qualitative or quantitative comparisons will be performed using this data.

Project Documents and Records Table

Sample Collection Records	Field Analysis Records	Fixed Laboratory Records	Data Assessment Records	Other _____
Field Notes	Sample Receipt, Custody, and Tracking Records	Sample Receipt, Custody, and Tracking Records	Field Sampling Audit Checklists	
Chain-of-Custody Records	Standards Traceability Logs	Standard Traceability Logs	Field Analysis Audit Checklists	
Air Bills	Equipment Calibration Logs	Equipment Calibration Logs	Fixed Laboratory Audit Checklists	
Custody Seals	Sample Prep Logs	Sample Prep Logs	Data Validation Reports	
Telephone Logs	Run Logs	Run Logs	Corrective Action Forms	
Corrective Action Forms	Equipment Maintenance, Testing, and Inspection Logs	Equipment Maintenance, Testing, and Inspection Logs	Telephone Logs	
	Corrective Action Forms	Corrective Action Forms		
	Reported Field Sample Results	Reported Field Sample Results		
	Sample Disposal Records	Reported Results for Standards, QC Checks, and QC Samples		
	Telephone Logs	Instrument Printouts (raw data) for Field Samples, Standards, QC Checks, and QC Samples		
		Data Package Completeness Checklists		
		Sample Disposal Records		
		Telephone Logs		
		Extraction/Clean-up Records		
		Raw Data (stored on disk)		

Assessment and Response Actions

The sampling of fish tissue will take place over the period of June to September 2000. An assessment team will audit sampling activities during the first week of sampling (6/16/00 – 6/23/00). If problems are observed, the assessment team will request a documented corrective action response and follow-up to ensure that corrective actions are effective. In addition, depending upon the problems identified, the assessment team may perform additional evaluations later in the sampling program.

Analysis of samples is currently scheduled to begin in June 2000 and continue to October 2000. A fixed laboratory technical systems audit will take place at ELM Laboratories April 24, 2000. If problems are observed, the assessment team will request a documented corrective action response and follow-up to ensure that corrective actions are effective prior to the start up of sampling. If the corrective actions are not taken or if they are not acceptable to the assessment team, the case team will be notified promptly. The case team will then adjust the sampling schedule and, if necessary, obtain the services of another laboratory.

Project Assessment Table

Assessment Type	Frequency	Internal or External	Organization Performing Assessment	Person(s) Responsible for Performing Assessment, Title and Organizational Affiliation	Person(s) Responsible for Responding to Assessment Findings, Title and Organizational Affiliation	Person(s) Responsible for Identifying and Implementing Corrective Actions (CA), Title and Organizational Affiliation	Person(s) Responsible for Monitoring Effectiveness of CA, Title and Organizational Affiliation
Field Sampling Technical Systems Audit	1/At sampling startup (6/16/00-6/23/00)	Internal	Brown Engineering	Andy Owens, QAO, Brown Engineering	Kate Jones, Sample Team Leader, Brown Engineering	Kate Jones, Brown Engineering	Andy Owens, Brown Engineering
Laboratory Technical Systems Audit	1/Prior to sampling startup (4/24/00)	External	Brown Engineering	Andy Owens, QAO, Brown Engineering	Betty Smith, QAO, ELM Laboratories	Betty Smith, ELM Laboratories	Andy Owens, Brown Engineering

QA Management Reports Table

Type of Report	Frequency (daily, weekly monthly, quarterly, annually, etc.)	Projected Delivery Date(s)	Person(s) Responsible for Report Preparation, Title, and Organizational Affiliation	Report Recipients, Title, and Organizational Affiliation
Field Sampling Technical Systems Audit Report	1/At startup of sampling	7/6/00	Andy Owens, QAO, Brown Engineering	John Smith, RPM, USEPA; Betty Fox, QAM, USEPA; Thomas Jackson, PM, Fort Longstreet; Amy Lee, Project Manager, Brown Engineering; Kate Jones, Sample Team Leader, Brown Engineering
Fixed Laboratory Technical Systems Audit Report	1/Prior to sampling startup	5/8/00	Andy Owens, QAO, Brown Engineering	John Smith, RPM, USEPA; Betty Fox, QAM, USEPA; Thomas Jackson, PM, Fort Longstreet; Amy Lee, Project Manager, Brown Engineering; Jane Barber, Laboratory Manager, ELM Laboratories; Betty Smith, ELM Laboratories
Data Usability Assessment Report	1/After all data are generated and validated	12/1/00	Amy Lee, Project Manager, Brown Engineering	John Smith, RPM, USEPA; Betty Fox, QAM, USEPA; Thomas Jackson, PM, Fort Longstreet; Andy Owens, QAO, Brown Engineering; Henry Phelps, Risk Assessor, Brown Engineering
Final Project Report	1/After QA Management Reports and risk assessment completed	2/4/01	Amy Lee, Project Manager, Brown Engineering	John Smith, RPM, USEPA; Betty Fox, QAM, USEPA; Thomas Jackson, PM, Fort Longstreet; Andy Owens, QAO, Brown Engineering

Figure 29a. Data Verification/Validation Process Table

Verification/ Validation Task	Description	I/E	Responsibility for Verification/Validation (Name, Organization)
Chain-of-custody and shipping forms	Chain-of-custody forms and shipping documentation will be reviewed internally upon their completion and verified against the packed sample coolers they represent. When everything checks out, the shippers signature on the chain-of-custody will be initialed by the reviewer, a copy of the chain-of-custody will be retained in the site file, and the original and remaining copies will be taped inside the cooler for shipment. See chain-of-custody SOP for further details.	I	Kate Jones Brown Engineering
Audit Reports	Upon report completion, a copy of all audit reports will be placed in the site file. If corrective actions are required, a copy of the documented corrective action taken will be attached to the appropriate audit report in the site file. At the beginning of each week, and at the completion of the site work, site file audit reports will be reviewed internally to ensure that all appropriate corrective actions have been taken and that corrective action reports are attached. If corrective actions have not been taken, the site manager will be notified to ensure action is taken.	I	Andy Owens Brown Engineering
Field Notes	Field notes will be reviewed internally and placed in the site file. A copy of the field notes will be attached to the final report.	I	Kate Jones Brown Engineering
Field Analytical Work	All field analytical data will be verified against the QAPP requirements for completeness and accuracy based on the field calibration records.	I	Kate Jones Brown Engineering
Laboratory Data	All laboratory data packages will be verified internally by the laboratory performing the work for completeness and technical accuracy prior to submittal. All received data packages will be verified externally according to the data validation procedures specified in Figure 29b.	I E	Betty Smith ELM Laboratories Stan Moore Brown Engineering
DV Reports	All data validation reports received from the data validators will be verified externally for completeness and technical accuracy. One out of every 10 samples will be verified against the original laboratory results to check for transcription errors.	E	Andy Owens Brown Engineering

Figure 29b. Data Verification/Validation Summary Table

Medium/ Matrix	Analytical Parameter	Concentration Level	Verification/Validation Criteria	Data Verificator/Validator (Title and organizational affiliation)	Responsibility for Data Verification/Validation (Title and organizational affiliation)
Fish Tissue	Aroclors/ Pesticides	Low	Region 13 - Data Validation Guidelines	Stan Moore, Data Validator, Brown Engineering	Andy Owens, QAO, Brown Engineering
Fish Tissue	Total Mercury	Low	Region 13 - Data Validation Guidelines	Stan Moore, Data Validator, Brown Engineering	Andy Owens, QAO, Brown Engineering

Data Usability Assessment

The Data Usability Assessment will be performed by a team of personnel at Brown Engineering. Amy Lee, Project Manager, will be responsible for information in the Usability Assessment. She will also be responsible for assigning task work to the individual task members who will be supporting the Data Usability Assessment. Note that the Data Usability Assessment will be conducted on validated data. After the Data Usability Assessment has been performed, data deemed appropriate for use will then be used to conduct a human health risk assessment on fish consumption. The results of the Data Usability Assessment will be presented in the final project report. The following items will be assessed and conclusions drawn based on their results:

Precision – Results of all laboratory duplicates for both aroclors/pesticides and mercury will be presented separately in tabular format for each analysis. For each duplicate pair, the relative percent difference (RPD) will be calculated for each analyte whose original and duplicate values are both greater than or equal to the quantitation limit. The RPDs will be checked against the measurement performance criteria presented on Worksheet 11. The RPDs exceeding criteria will be identified on the tables. Additionally, the RPD of each analyte will be averaged across all duplicate pairs whose original and duplicate values are both greater than or equal to the quantitation limit, and the combined overall average RPD for each analysis will be calculated for the laboratory duplicates. A discussion will follow summarizing the results of the laboratory precision. Any conclusions about the precision of the analyses will be drawn and any limitations on the use of the data will be described.

Accuracy/Bias Contamination – Results for all laboratory method blanks and instrument blanks will be presented separately in tabular format for each analysis for both aroclors/pesticides and mercury. The results for each analyte will be checked against the measurement performance criteria presented on Worksheet 11. Results for analytes that exceed criteria will be identified on the tables. A discussion will follow summarizing the results of the laboratory accuracy/bias. Any conclusions about the accuracy/bias of the analyses based on contamination will be drawn and any limitations on the use of the data will be described.

Overall Accuracy/Bias – The results for the 2nd Source Standard/SRM will be presented in tabular format to compare these results to the sample batch they apply to. These results will be compared to the requirements listed on Worksheet #11. A discussion will follow summarizing overall accuracy/bias. Any conclusions about the overall accuracy/bias of the analyses will be drawn and any limitations on the use of the data will be described.

Sensitivity – Results for all laboratory fortified blanks will be presented separately in tabular format for each analysis for both aroclors/pesticides and mercury. The results for each analyte will be checked against the measurement performance criteria presented on Worksheet 11 and cross-checked against the quantitation limits presented on Worksheet 9b. Results for analytes that exceed criteria will be identified on the tables. A discussion will follow summarizing the results of the laboratory sensitivity. Any conclusions about the sensitivity of the analyses will be drawn and any limitations on the use of the data will be described.

Data Usability Assessment (Continued)

Representativeness – Although sample size somewhat limits the statistical confidence for applying contaminant levels to the entire population, it does conform to currently accepted methods. Composite sample data can be used to set fish consumption advisories if the number of fish/species/reach within the required size range are collected and 85% fish collection completeness is achieved.

Comparability – The results of this study will be used as a benchmark for determining comparability for data collected during any potential future sampling events using the same or similar sampling and analytical SOPs.

Completeness – A completeness check will be done on all of the data generated by the laboratory. Completeness criteria are presented on Worksheet 11. Completeness will be calculated for each analyte as follows. For each analyte, completeness will be calculated as the number of data points for each analyte that meets the measurement performance criteria for precision, accuracy/bias, and sensitivity, divided by the total number of data points for each analyte. A discussion will follow summarizing the calculation of data completeness. Any conclusions about the completeness of the data for each analyte will be drawn and any limitations on the use of the data will be described.

Graphics – Fish Tissue Analysis: Graphic plots will be constructed depicting the contaminant concentrations (fillet, offal, and total) found at each sampling location by fish species. Each plot will present the total concentration range of each contaminant (Hg), or combined group of contaminants (aroclors/pesticides) and the number of valid data points used. **Note:** Based on the results of the data, a statistician will use his/her professional judgment to include other pertinent parameters. Each graphic will contain a detailed legend. Additionally, each graphic will include a summary report indicating trends, anomalies, or other factors pertinent to the understanding of the data.

Reconciliation – Each of the Project Quality Objectives (PQOs) presented on Worksheet 11 will be examined to determine if the objective was met. This examination will include a combined overall assessment of the results of each analysis pertinent to an objective. Each analysis will first be evaluated separately in terms of the major impacts observed from the Data Validation, Data Quality Indicators, and measurement performance criteria assessments. Based on the results of these assessments, the quality of the data will be determined. Based on the quality determined, the usability of the data for each analysis will be determined. Based on the combined usability of the data from all analyses for an objective, it will be determined if the PQO was met and whether project action limits were exceeded. The final report will include a summary of all the points that went into the reconciliation of each objective. As part of the reconciliation of each objective, conclusions will be drawn and any limitations on the usability of any of the data will be described.

ATTACHMENT 1

STANDARD OPERATING PROCEDURES (SOPs)

The IDQTF did not want to release samples of SOPs with this example QAPP. However, note that SOPs contain critical information for understanding, approving, and implementing project operations as presented in the QAPP and, as such, all relevant SOPs must be available in order for the QAPP to be reviewed and approved.